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Park

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[54] **OPERATIONAL SWITCH FOR A MICROWAVE OVEN**

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[73] Assignee: **Daewoo Electronics Co., Ltd.**, Seoul, Rep. of Korea

[21] Appl. No.: **594,970**

[22] Filed: **Jan. 31, 1996**

[30] **Foreign Application Priority Data**

Jun. 23, 1995 [KR] Rep. of Korea 95-17207

[51] **Int. Cl.**[6] **H05B 6/68**

[52] **U.S. Cl.** ..... **219/702**; 219/715; 219/719; 219/685; 200/38 FA

[58] **Field of Search** ..... 219/702, 703, 219/715, 685, 719, 721, 722; 200/38 FA, 38 R

[56] **References Cited**

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Primary Examiner—Philip H. Leung

Attorney, Agent, or Firm—Lowe, Price, LeBlanc & Becker

[57] **ABSTRACT**

Disclosed is an operational switch for a microwave oven using a pair of gears and a pair of micro switches in order for a magnetron and a heater of a microwave oven to operate. At the rear surface of a control panel, a first switch for turning on/off the magnetron and a first gear having a pair of pushing pieces for controlling the first switch are installed. At an edge of the first gear a second switch for controlling the heater is provided. A second gear for controlling the second switch is provided while meshing together with a power controlling gear of a timer body. A pair of pushing pieces are protrudingly formed on the surface of second gear. The first gear further includes a stopper and a pair of impeding pieces for limiting the rotation range and a pair of elastic pieces and a ring type guiding member for guiding the rotation. According to the invention, the productivity of a microwave oven can be improved because the number of components of a microwave oven is reduced, the bad quality components are avoided from being produced, and the assembling time of a microwave oven is shortened.

10 Claims, 10 Drawing Sheets

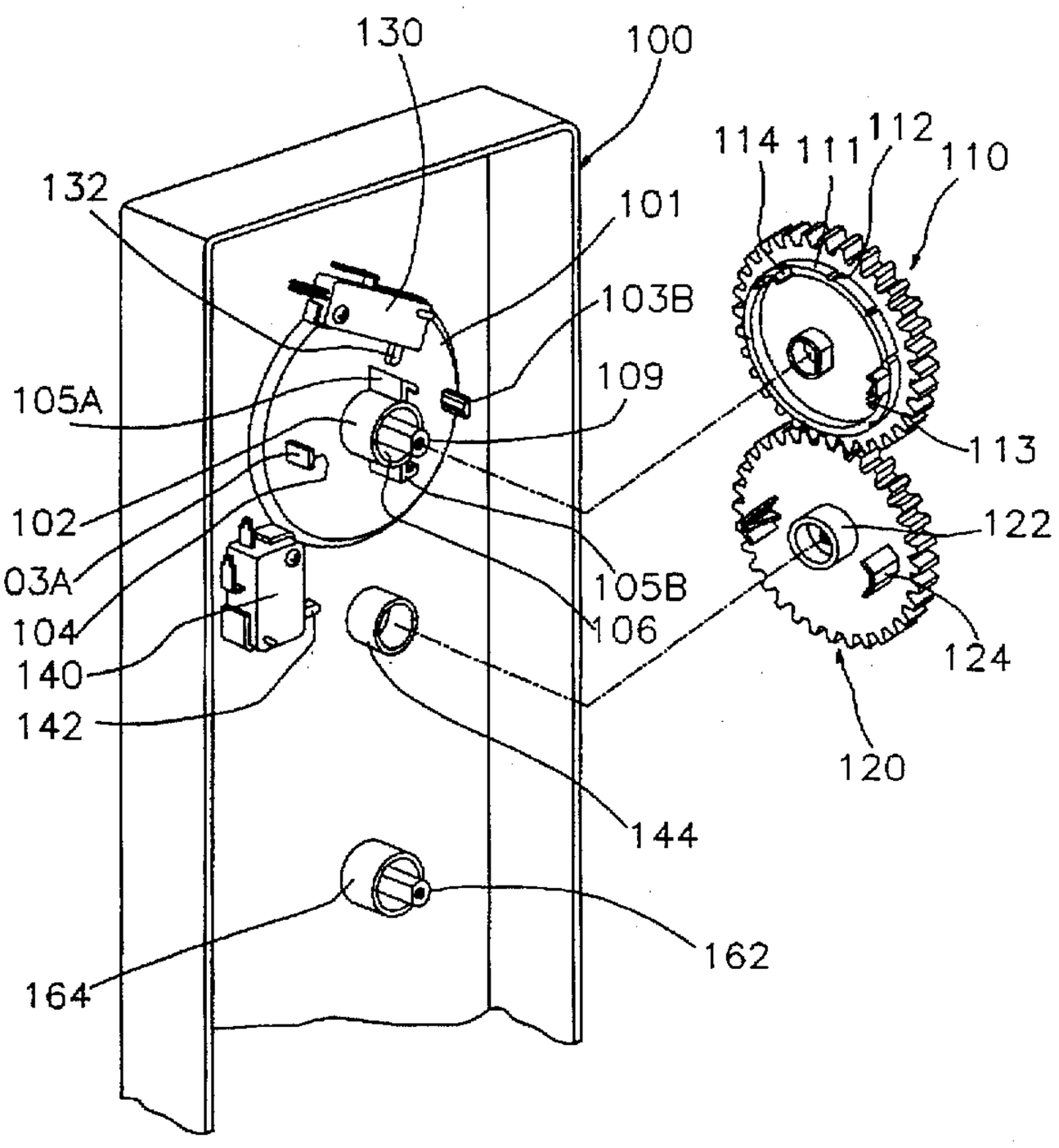


FIG. 1
(PRIOR ART)

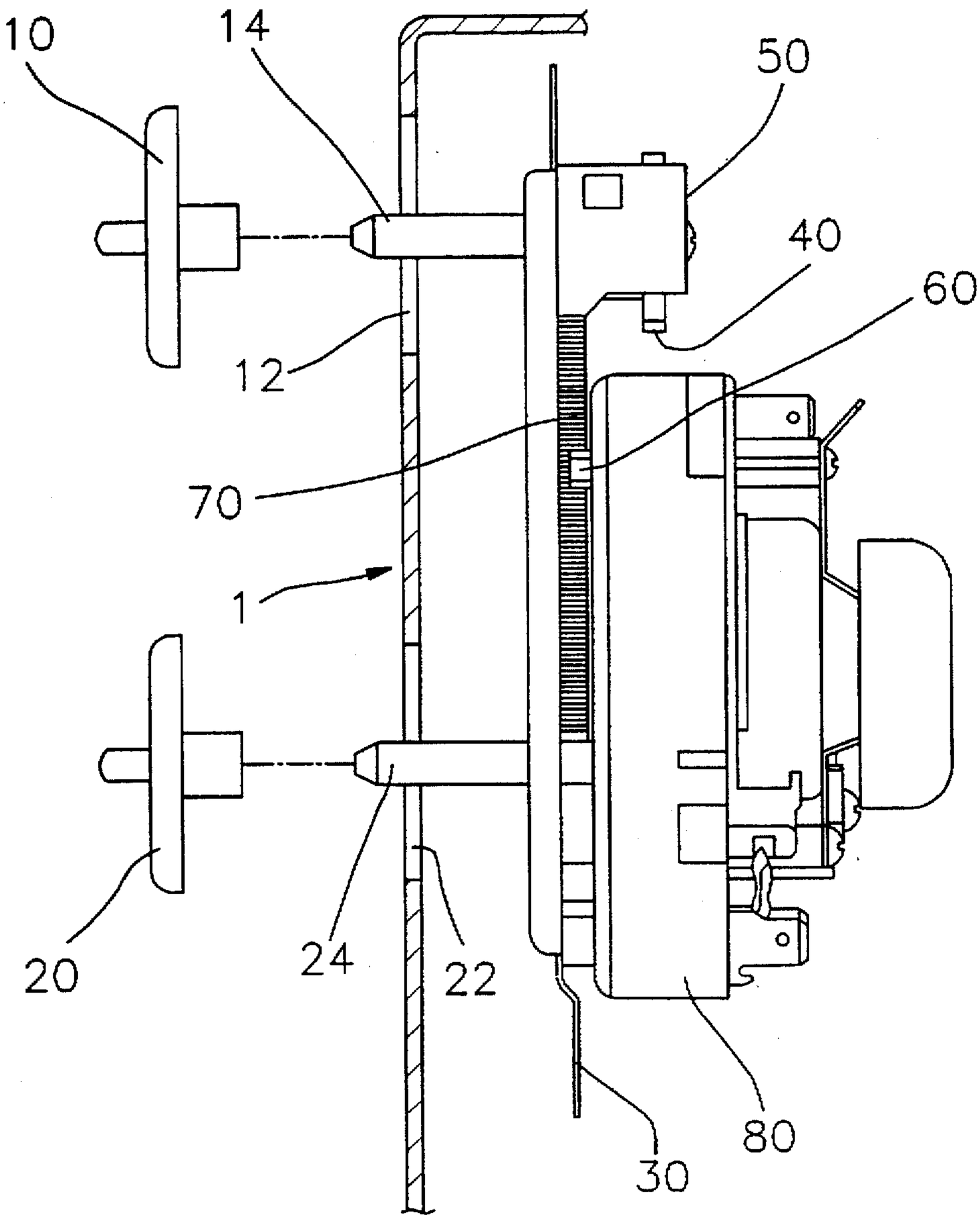
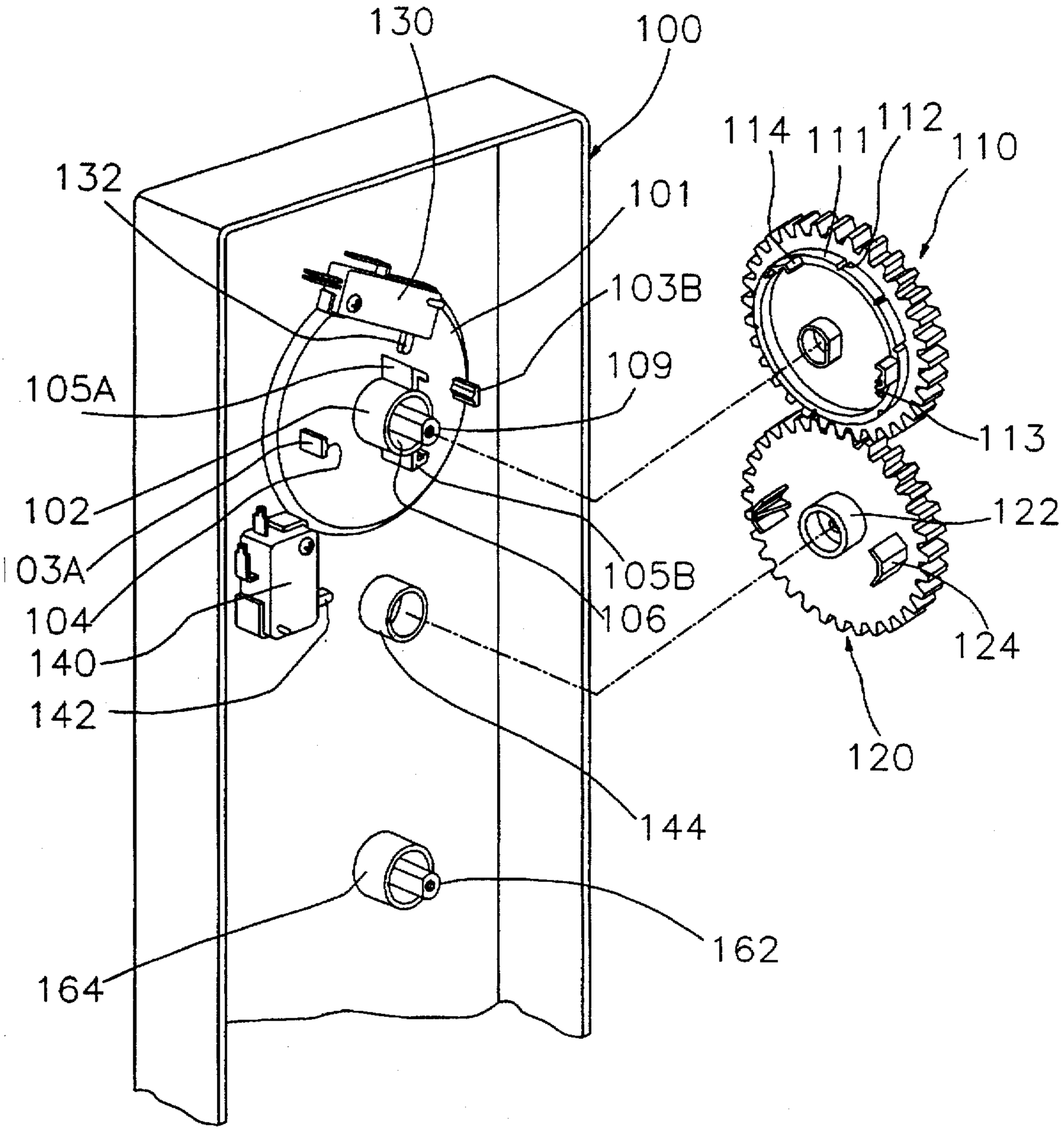


FIG.2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100
132
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103B
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105A
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103A
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164
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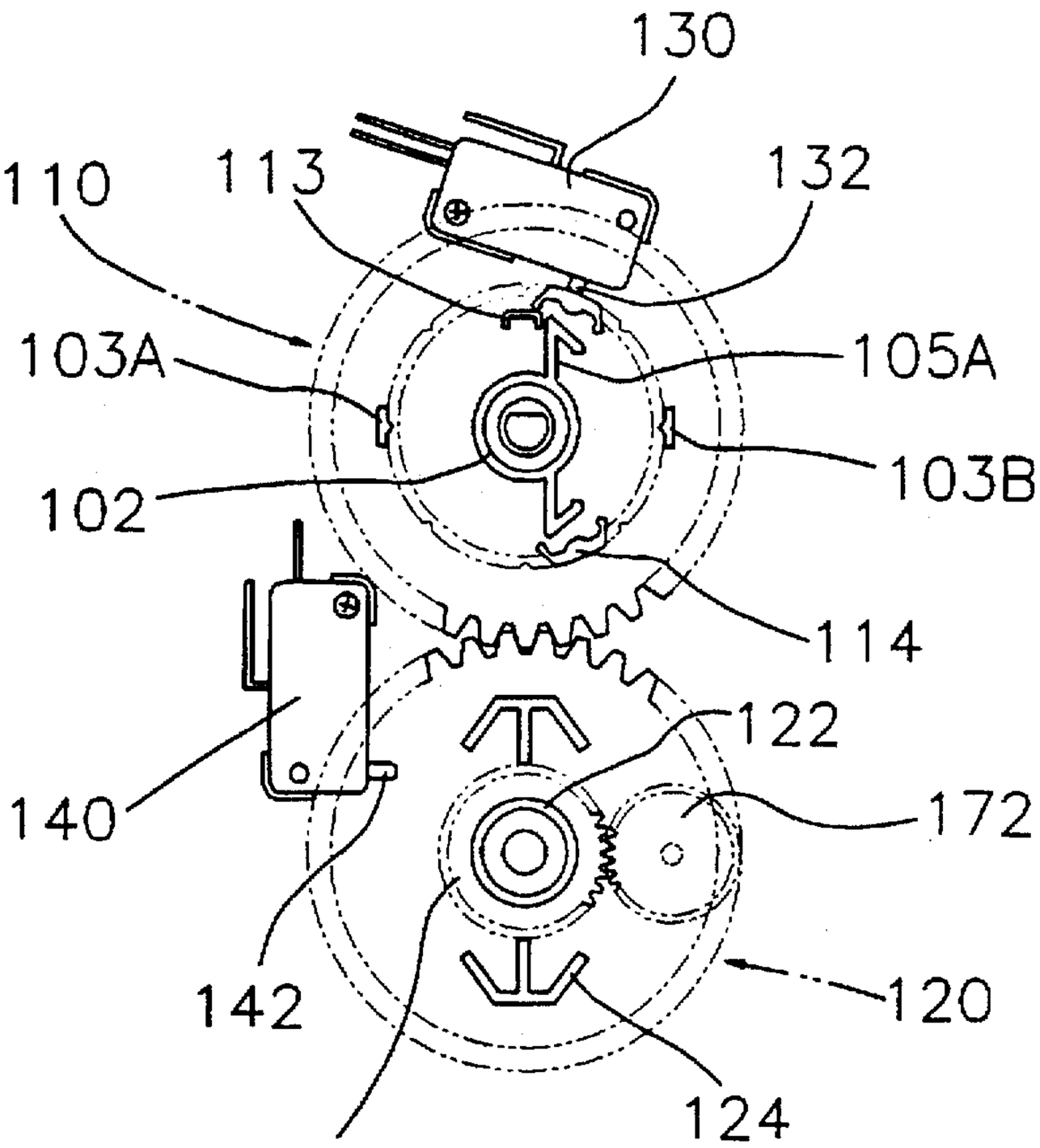
FIG.3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103A
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FIG.4

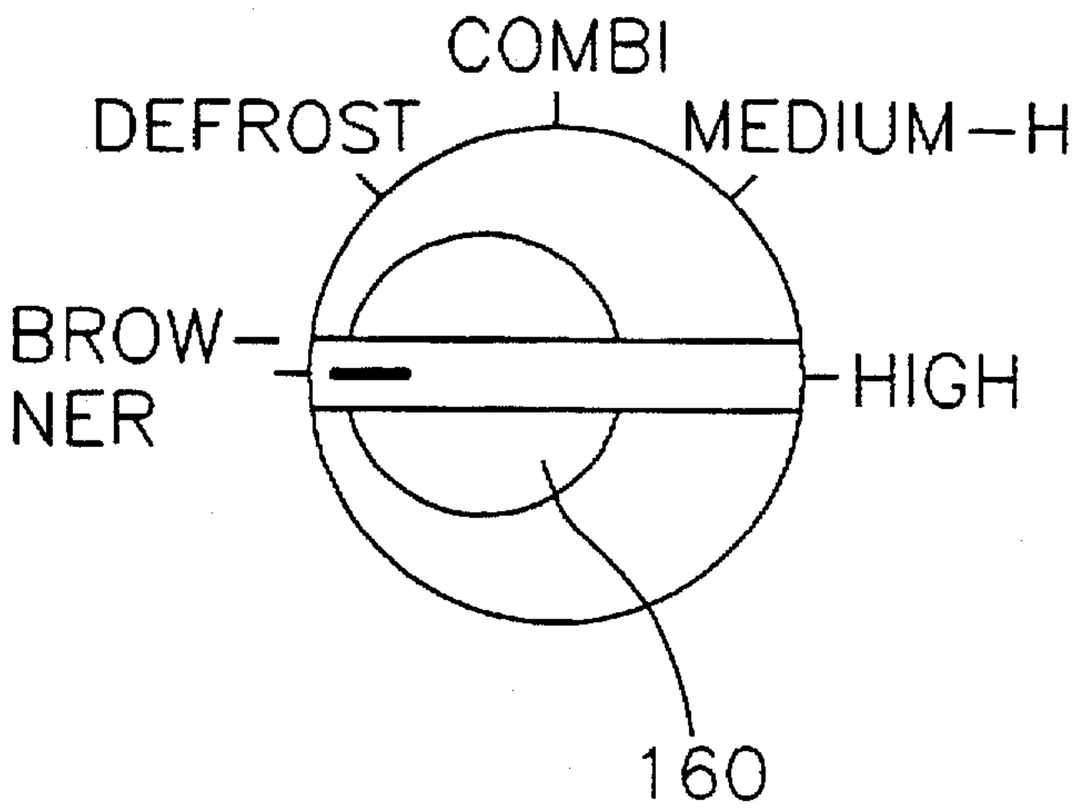
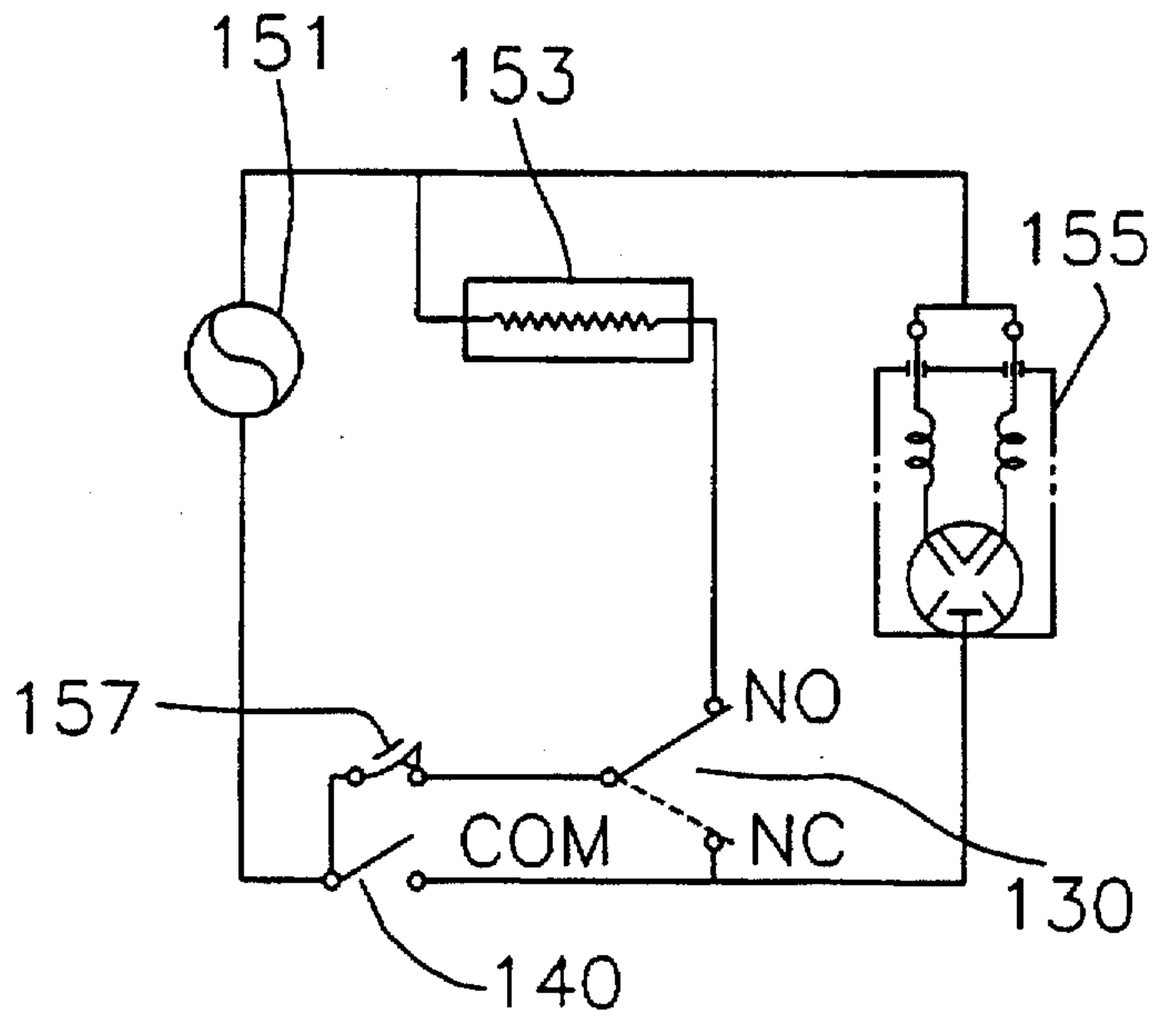

COMBI
DEFROST
MEDIUM-H
BROW-
NER
HIGH
160

FIG.5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153
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COM
NC
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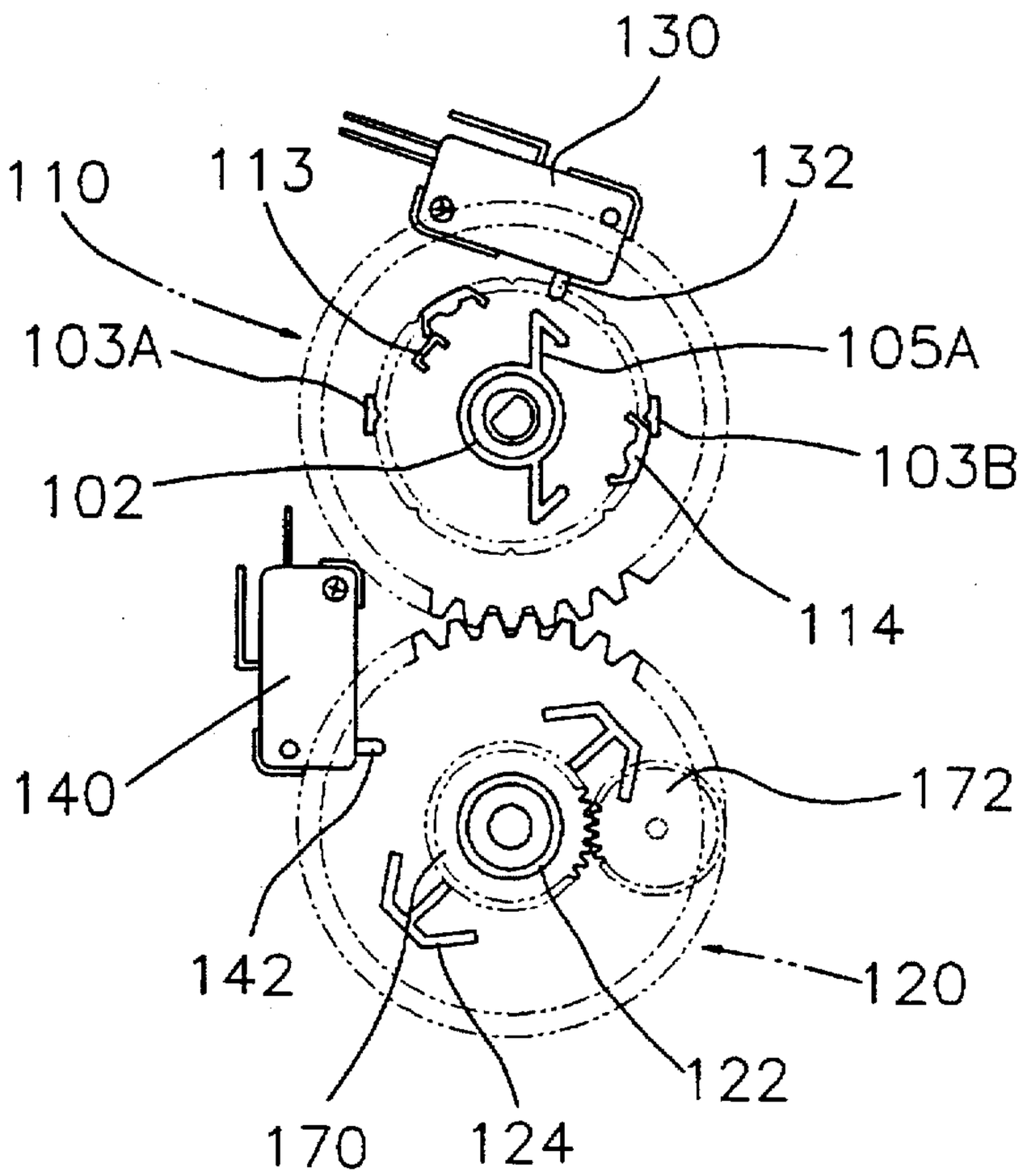
140

FIG.6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105A
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103B
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172
142
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122
170
124

FIG.7

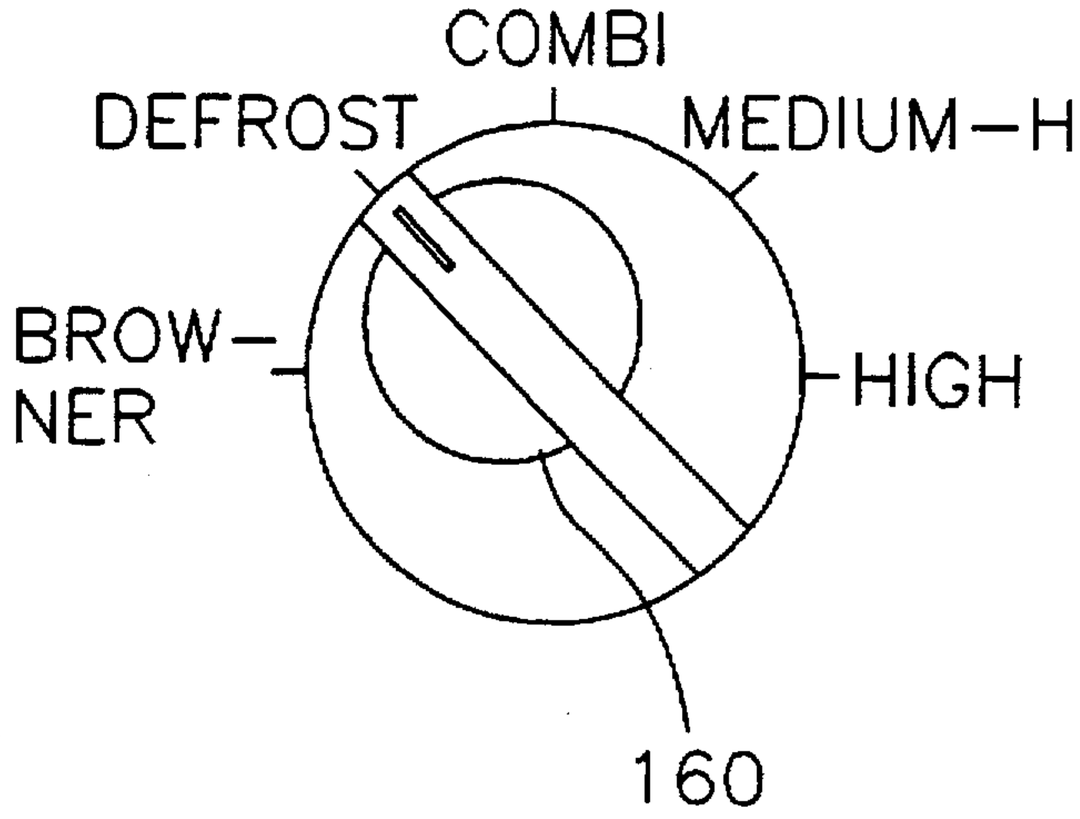
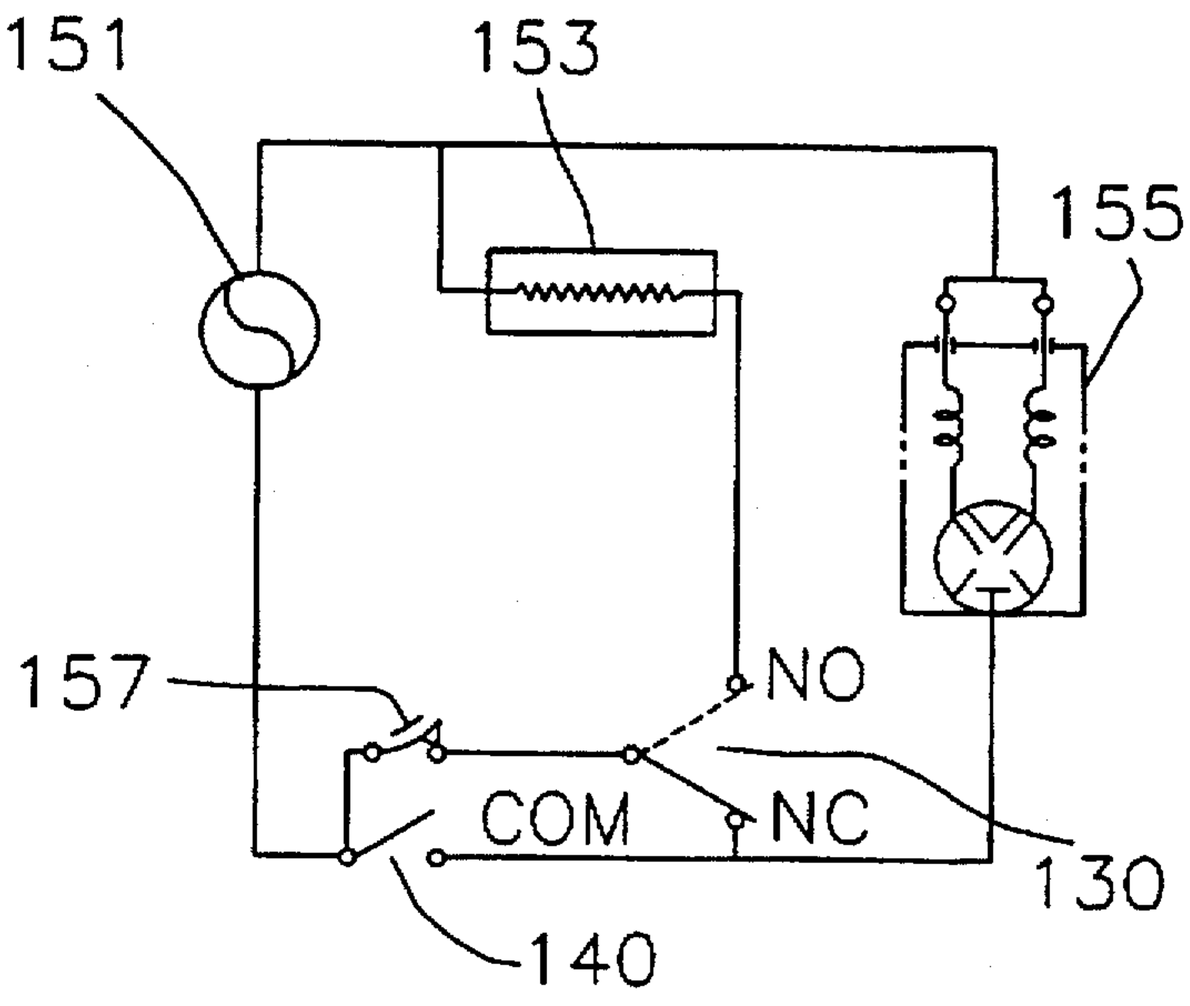

COMBI
DEFROST
MEDIUM-H
BROW-
NER
HIGH
160

FIG.8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COM
NC
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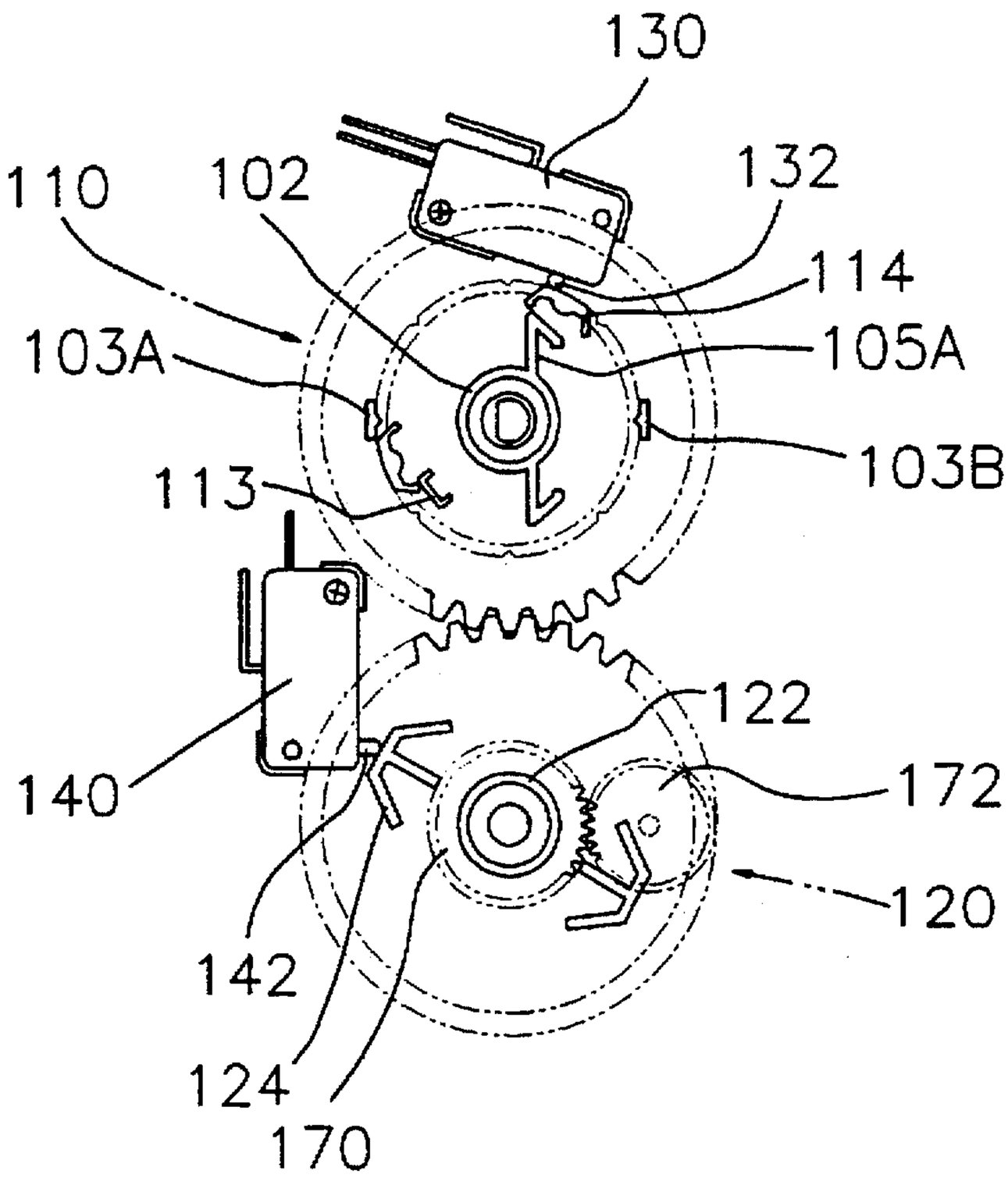
140

FIG.9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103A
105A
103B
113
140
122
172
120
142
124
170

FIG.10

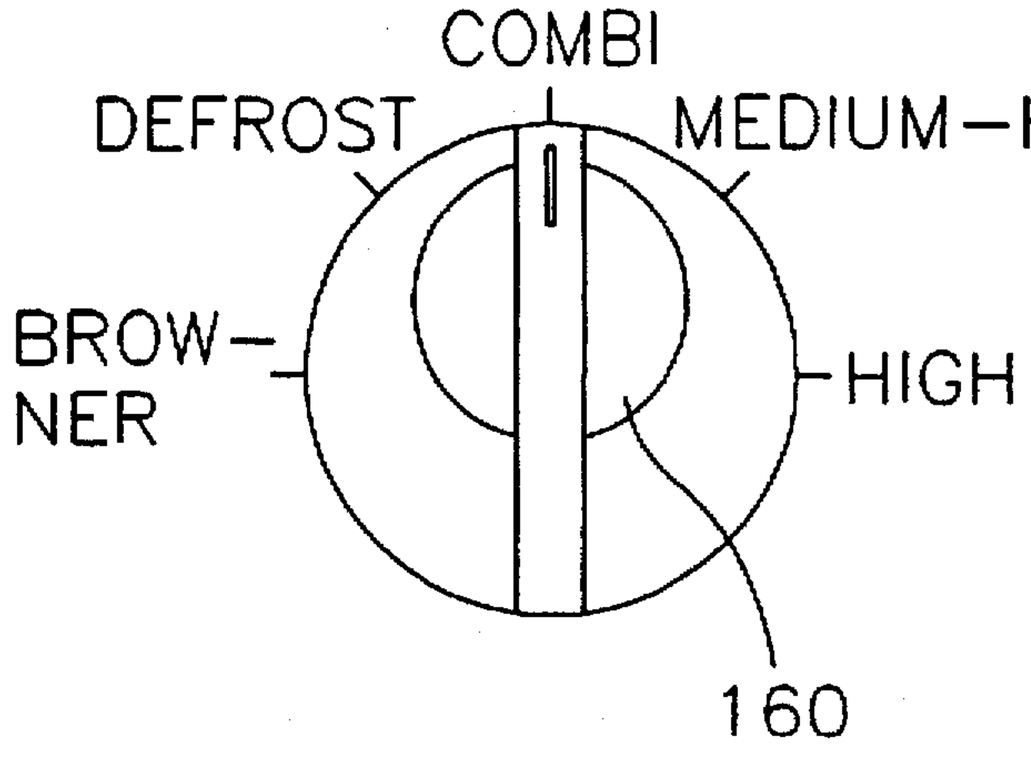
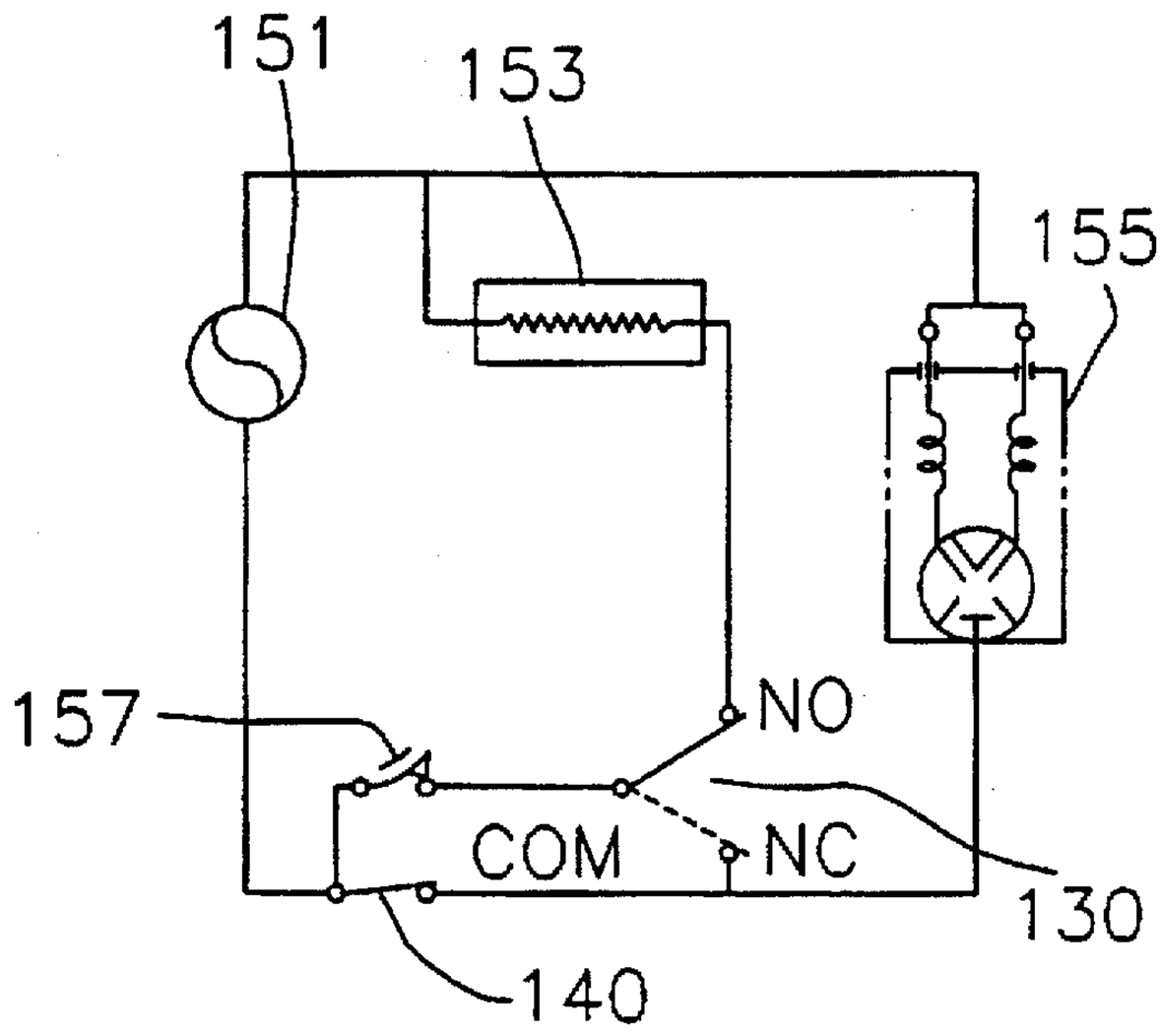

COMBI
DEFROST
MEDIUM-H
BROW-
NER
HIGH
160

FIG. 11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COM
NC
130
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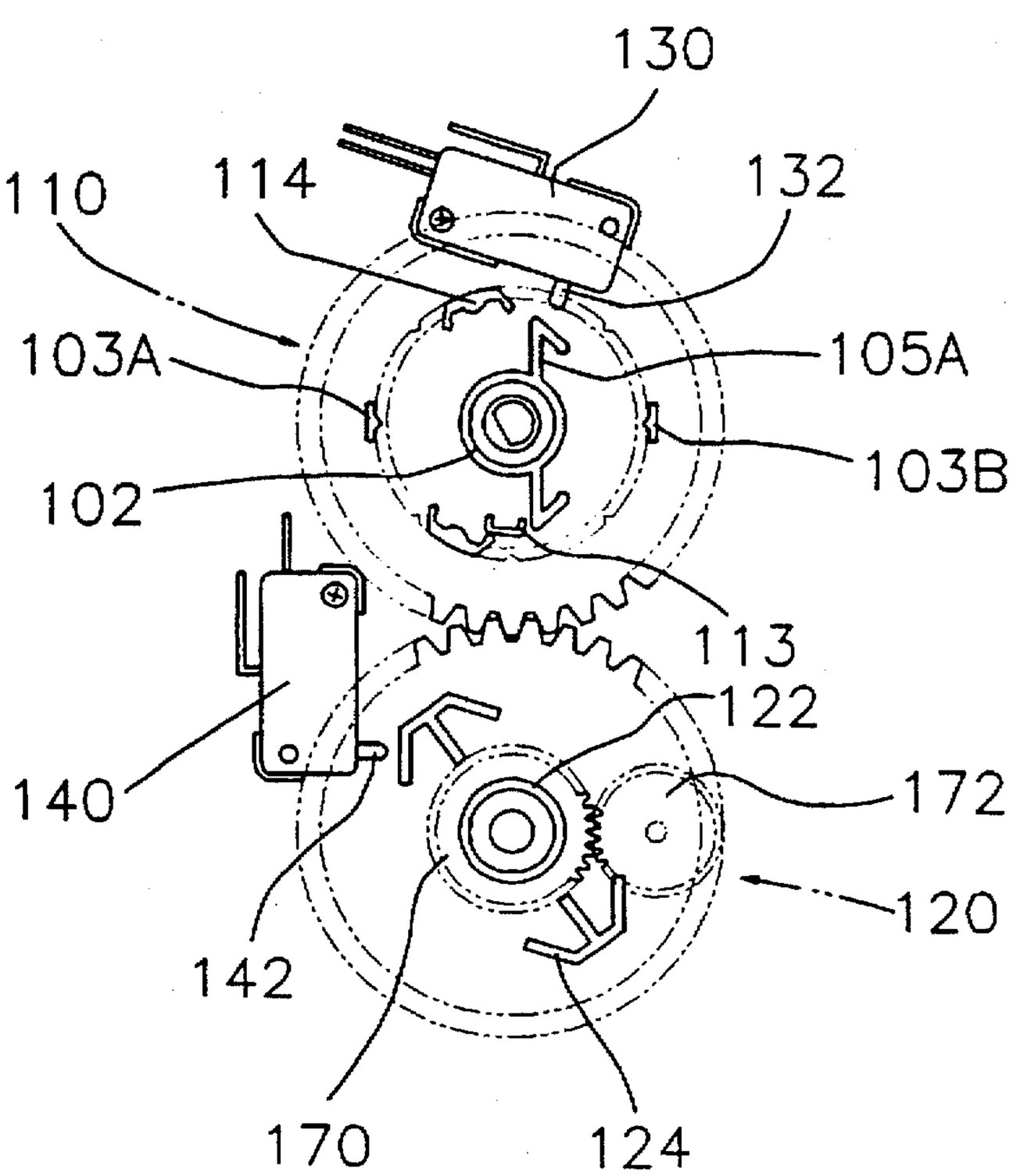
FIG. 12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103A
105A
103B
102
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140
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124

FIG.13

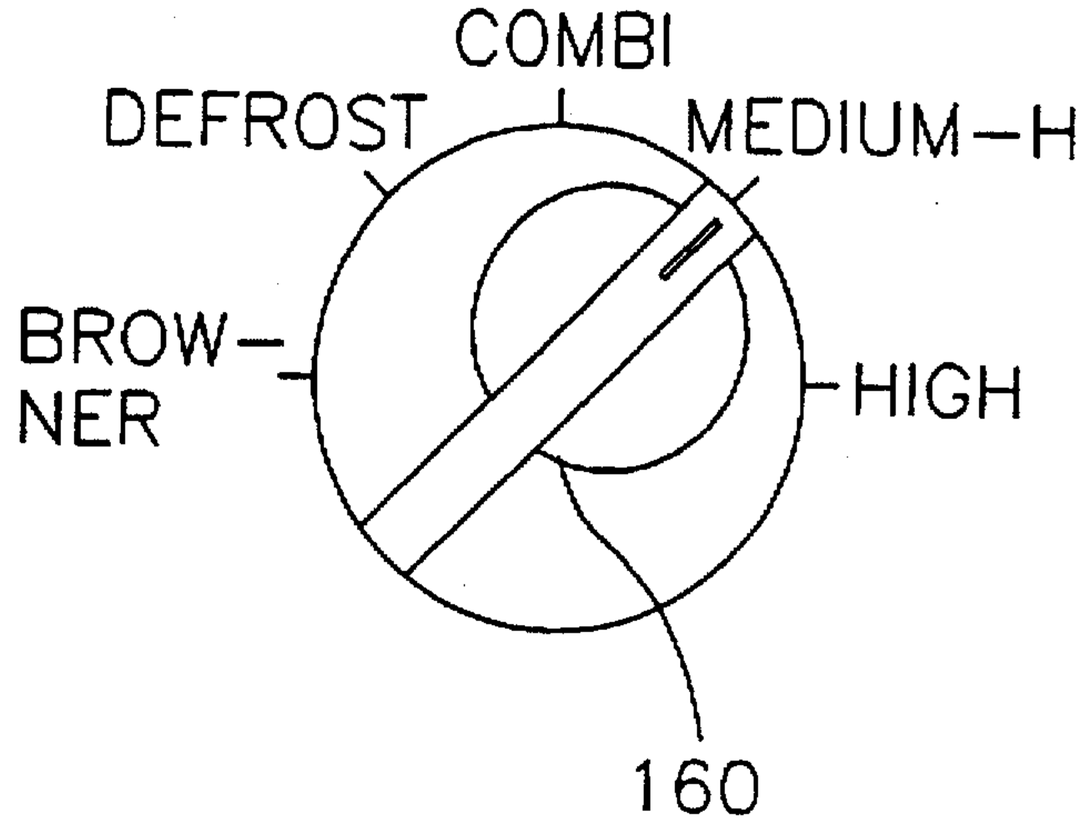
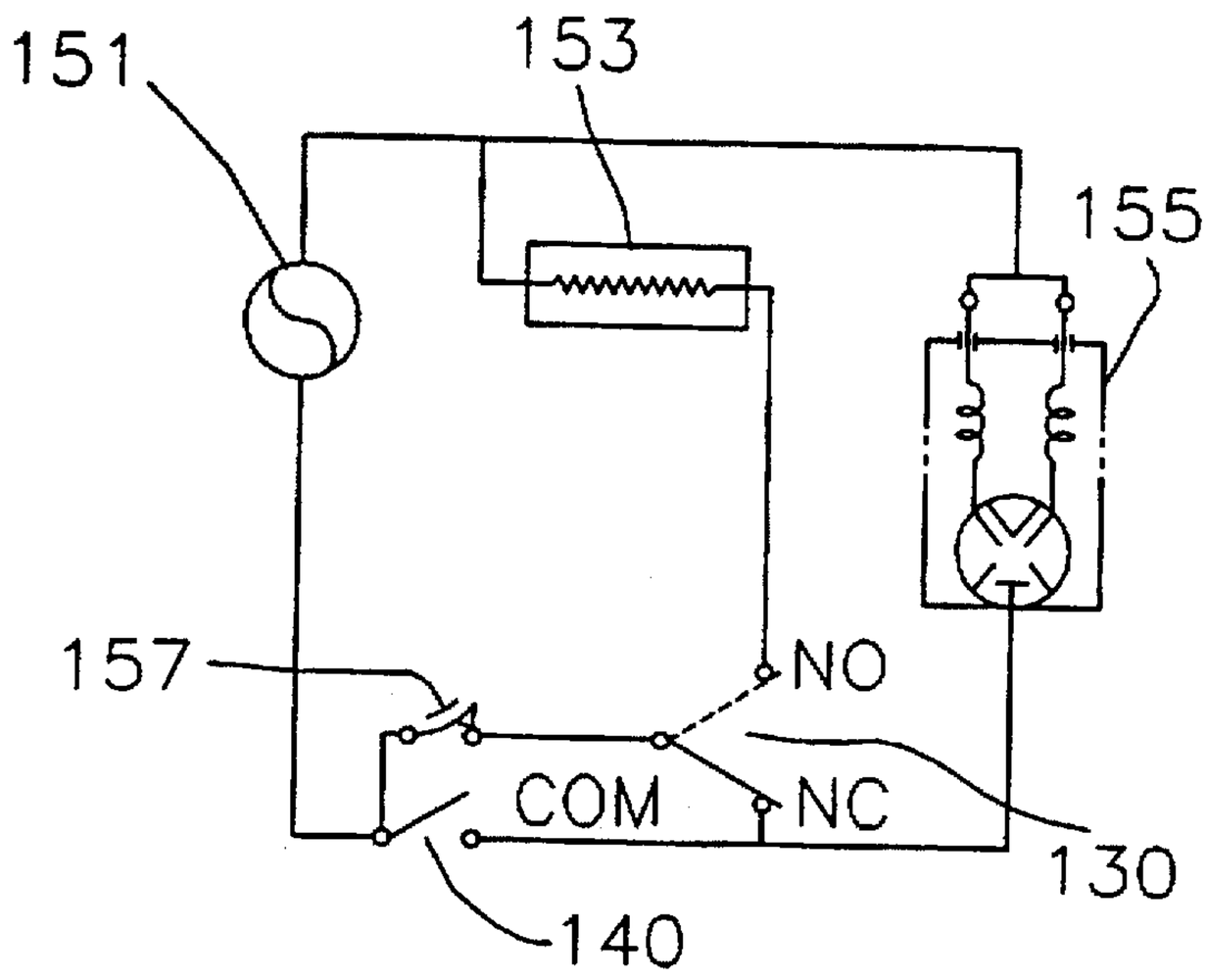

COMBI
DEFROST
MEDIUM-H
BROW-
NER
HIGH
160

FIG.14


151
153
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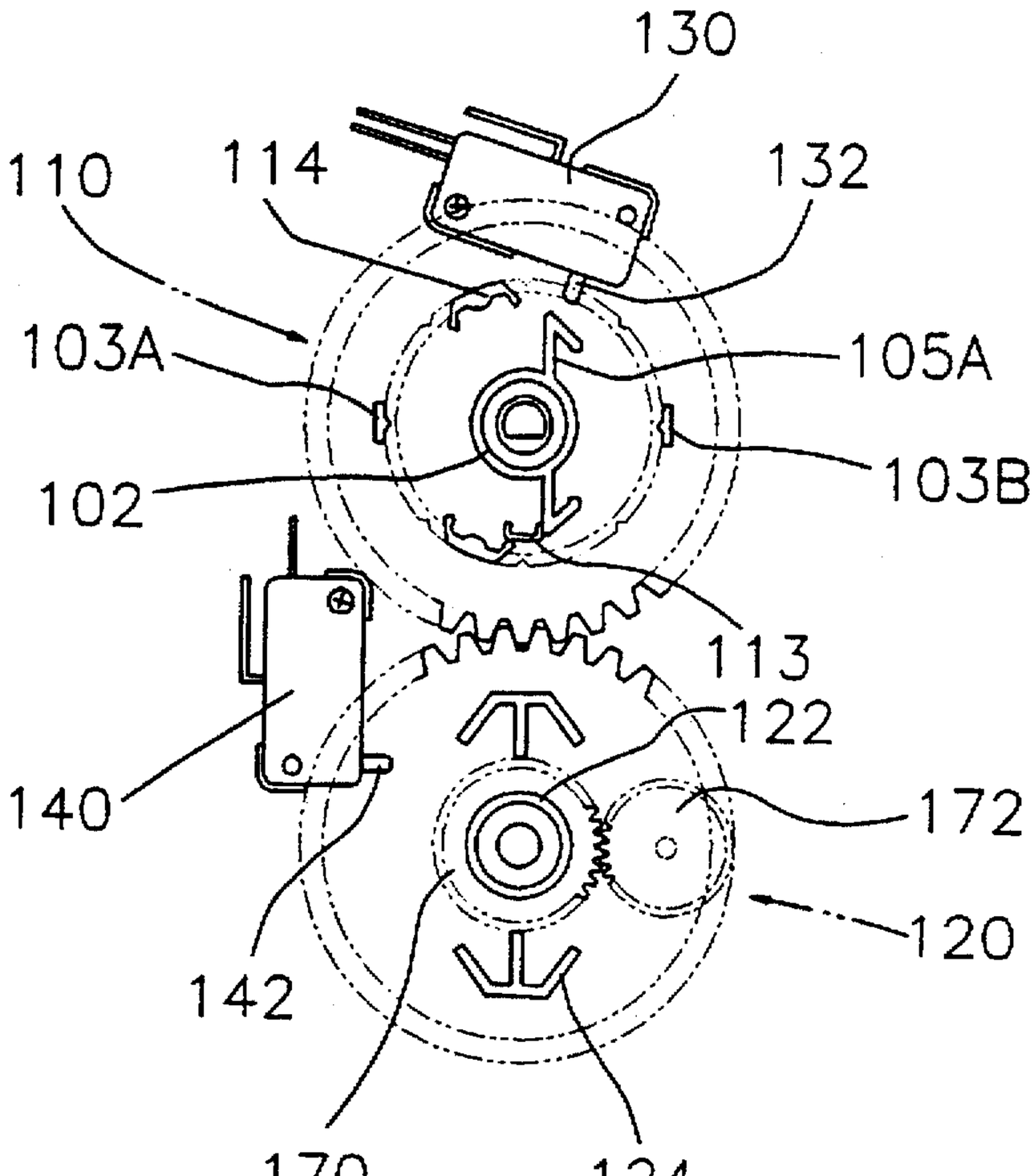
157
NO
COM
NC
130
140

FIG. 15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103A
105A
102
103B
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142
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124

FIG. 16

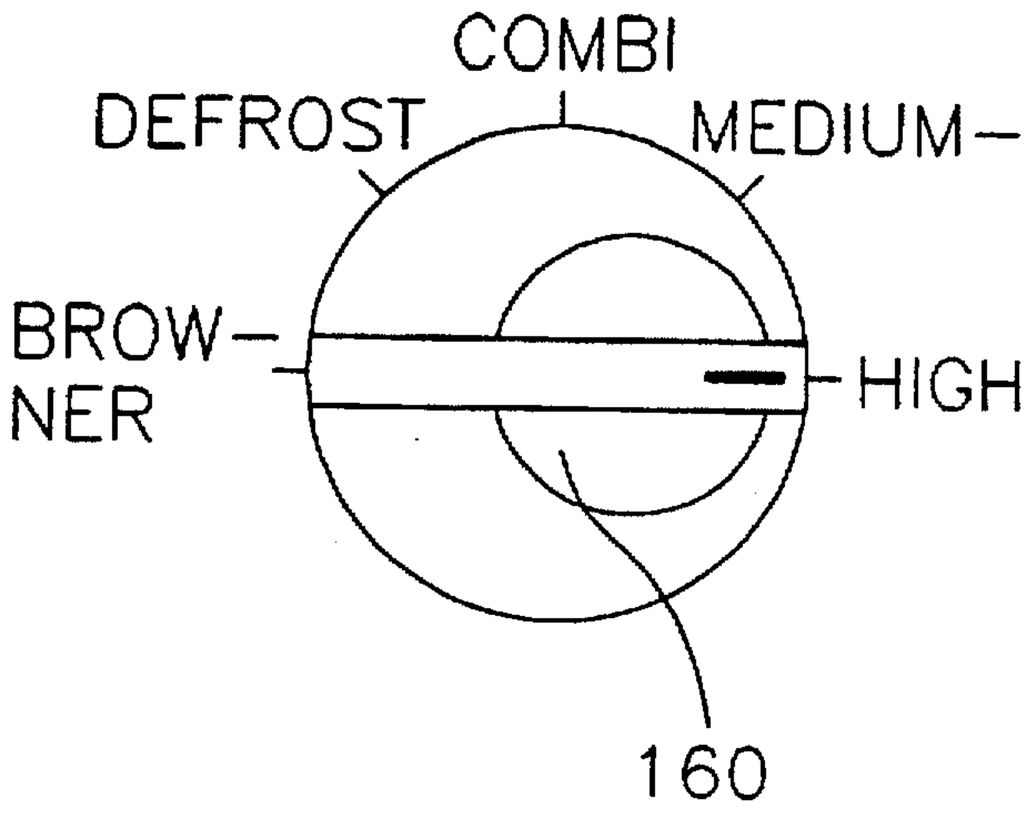
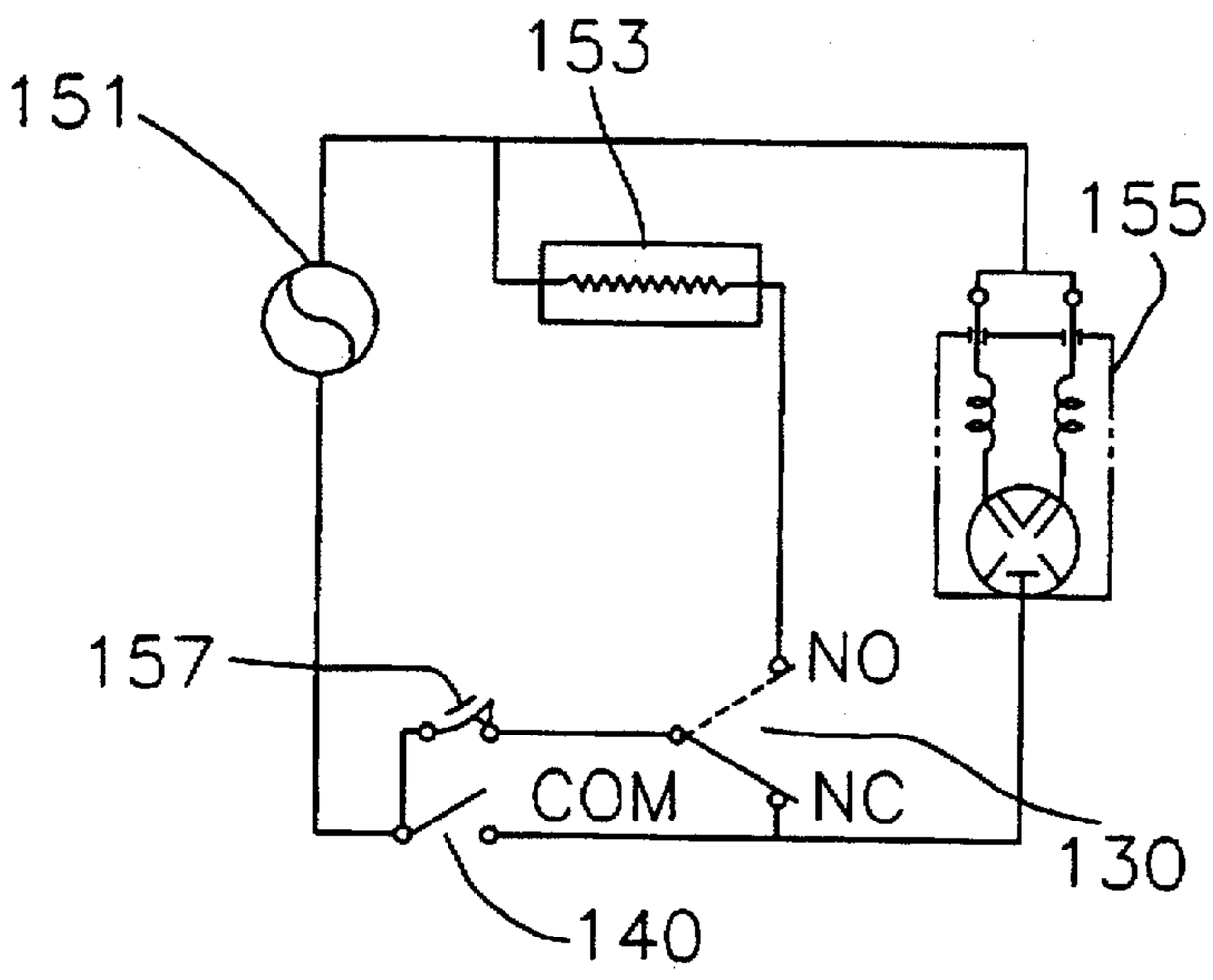

COMBI
DEFROST
MEDIUM-H
BROW-
NER
HIGH
160

FIG.17



OPERATIONAL SWITCH FOR A MICROWAVE OVEN

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an operational switch for a microwave oven composed of an electric heating device and a magnetron device for generating a high frequency, and more particularly to an operational switch for a microwave oven capable of controlling both a heater and a magnetron at the same time.

2. Description of the Prior Art

An electric field room of a microwave oven includes a magnetron for generating high frequency and an electric heater. The high frequency that is generated by high voltage which is generated by a mutual induction of a first and a second induction coil disposed on a lower surface of the electric field room is safely applied to the magnetron. Such a high frequency is irradiated into a cooking chamber of a microwave oven through an irradiating tube. When the high frequency is irradiated to the inside of the cooking chamber through the irradiating tube, food placed in the cooking chamber is heated and cooked.

In the microwave oven described above, a constant operating time and the strength of the power should be adjusted depending upon what kind of food is to be cooked. Accordingly, the microwave oven includes a timer for controlling a time period for which the high frequency is being generated and a power controlling device for controlling the on/off operation period of the magnetron. That is, adjusting the period of on/off operation of the magnetron means controlling the power of a microwave oven. Such a timer and a power controlling device are installed at the rear portion of a control panel. The control panel for controlling the overall operation of a microwave oven is provided at one side of a front panel of a microwave oven.

Inside the cooking chamber of a microwave oven, an electric heater is provided for heating food thereby, for example, fish, bread or cookie to be broiled or baked. The electric heater is operated by a cam installed within the power controlling device.

Around a knob of the power controlling device, five steps of BROWNER, DEFROST, COMBI, MEDIUM-HIGH and HIGH for controlling the power are provided. When the BROWNER step is selected, only the electric heater operates so that such food as fish, bread, or cookie can be broiled or baked. The DEFROST step makes the magnetron operate weakly for frozen meat to be defrosted. When the COMBI step is selected, the electric heater operates and the magnetron operates with a medium power so that a roast chicken or a roast turkey may be made. The MEDIUM-HIGH step causes the electric heater to be turned off and the magnetron operates with a medium power. Finally, the HIGH step is used for operating the magnetron with a maximum power while the electric heater is turned off.

According to such a conventional microwave oven, a timer and a power controlling device are installed at the rear portion of the control panel by using a separate bracket for timer. U. S. Pat. No. 5,455,403 discloses a power controlling device similar as described in the foregoing.

FIG. 1 shows a side sectional view of the operational switch provided in the conventional microwave oven described as above. As shown in FIG. 1, control panel **1** includes a rotating through hole **12** for a power controlling knob **10** and a rotating through hole **22** for a timer controlling knob **20**. At the rear side of control panel **1**, a timer bracket **30** is disposed. At timer bracket **30** a power controlling device and a timer are fixed.

The power controlling device includes a power controlling knob **10**, a shaft **14**, a supporting bracket **50**, a cam **40**, a rack **70** and a power controlling gear **60**. Power controlling knob **10** is fitted to one end of shaft **14**, and the other end of shaft **14** is fixed at a timer bracket **30** by means of supporting bracket **50**. Between shaft **14** and supporting bracket **50**, cam **40** inserted into shaft **14** is provided. Cam **40** operates the electric heater while rotating together with shaft **14** and limits the range of the rotation of shaft **14**. In case of the microwave oven without a heating device, cam **40** only functions to limit the range of the rotation. At the circumference of cam **40**, tooth are formed which are then matched with rack **70**. At a part of rack **70**, a power controlling gear **60** of a timer **80** is combined.

Timer **80** includes a timer controlling knob **20**, a timer shaft **24**, and power controlling gear **60**. Timer controlling knob **20** is inserted into one end of timer shaft **24** and the other end of timer shaft **24** is fixed inside timer **80**.

When the microwave oven constructed as such is operated, the user must manually operate power controlling knob **10** and timer controlling knob **20**. When power controlling knob **10** is rotated to locate a step the user desires, the torque of output controlling knob **10** is transmitted to shaft **14**. When shaft **14** rotates with a predetermined angle, cam **40** rotating according to shaft **14** operates the electric heater. As cam **40** makes a rotation movement, rack **70** meshed with cam **40** makes a rectilinear motion. The rectilinear motion of rack **70** is transmitted to power controlling gear **60** meshed with rack **70**. Accordingly power controlling gear **60** makes a rotating motion. According to the rotation of power controlling gear **60**, on time and off time of the magnetron within one operating period of the magnetron may relatively be prolonged or shortened.

If timer controlling knob **20** is rotated to a desired extent by a user, the torque of timer controlling knob **20** is transmitted to timer shaft **24**. The rotated angle of timer shaft **24** is transmitted into timer **80** and thereby the magnetron and the electric heater operates for a predetermined time period. Thereafter, timer **80** terminates the operation of the magnetron and the electric heater.

According to the conventional microwave oven described in the foregoing, the operational switch is composed of supporting bracket **50**, a plate spring (not shown), cam **40**, rack **70**, etc. in order to operate the magnetron and the electric heater. Accordingly, the number of the components of a microwave oven is increased and the manufacturing cost becomes high. Further, due to the complicated structure of rack **70**, the manufacturing and assembling thereof is difficult.

SUMMARY OF THE INVENTION

Therefore, it is an object of the present invention to provide an operational switch for a microwave oven having a simple structure and a minor number of components so that the manufacturing cost can be reduced and the working efficiency can be improved.

The above object of the present invention can be achieved by providing an operational switch for a microwave oven comprising a knob inserted rotatably into a control panel; a first gear, the knob having a shaft being inserted into the center of the first gear, and a pair of pushing pieces being projected on one side thereof; a first switch for controlling a magnetron by means of the pushing pieces of the first gear;

a second gear meshed with the first gear by teeth, a pair of pushing pieces being projected on one face of the second gear, and a small sized gear meshed with a gear of the magnetron is provided on an opposite face of the second gear; and a second switch for controlling an electric heater by means of the pushing pieces of the second gear, whereby the rotation of the knob is transmitted to the first gear, the rotational position of the pushing piece of the first gear, the rotation of the first gear turning on/off the first switch, the rotation of the first gear is transmitted to the second gear, and the rotational position of the pushing piece, of the second gear turning on/off the second switch and simultaneously rotates the power controlling gear.

At this time, it is preferable that the first gear further includes a means for limiting the range of the rotation for the first gear to rotate within a predetermined angle. The rotation range limiting means may include a stopper protrudingly formed on one side of the first gear and a pair of impeding pieces protrudingly formed on the control panel supporting the knob shaft thereby to contact with the stopper.

Also, it is preferable that the first gear further includes a means for guiding the rotation site of the first gear. The rotation guiding means may include a pair of elastic pieces protrudingly and opposingly formed on the control panel and a ring type guiding member with plural grooves receiving the elastic pieces provided on one side of the first gear.

Further, the above object of the present invention can be accomplished by providing an operational switch for a microwave oven comprising a knob inserted rotatably into a control panel; a ring-shaped first gear with a plurality of grooves to receive a pair of elastic pieces protrudingly and oppositely formed on the control panel, a shaft of the knob being inserted into the center of the first gear, a pair of pushing pieces being protruded on one side thereof, and a stopper being formed at an edge of the pushing piece to contact with a pair of impeding pieces protrudingly formed on the control panel; a first switch for controlling the magnetron by means of the pushing pieces of the first gear; a second gear meshed with the first gear by teeth, a pair of pushing pieces being projected on one face of the second gear, and a small- sized gear meshed with a power controlling gear of the magnetron for controlling the magnetron power being provided on the other side thereof; a second switch for controlling an electric heater by means of the pushing pieces of the second gear, whereby the rotation of the knob is transmitted to the first gear, the rotational position of the pushing piece of the first gear controls the first switch, the rotational of the first gear is transmitted to the second gear, and the rotational position of the pushing piece of the second gear controls the second switch and simultaneously rotates the power controlling gear.

According to the construction as above, when the shaft of the knob rotates, the first gear assembled with the knob shaft is caused to rotate. The rotation of the first gear is transmitted to the second gear to thereby rotate the power controlling gear of the timer. According to the rotation of the first gear, the pushing pieces of the first gear control the first switch. Since the first switch is connected to the electric heater, the rotation of the first gear turns the heater on or off. As the second gear rotates, the pushing pieces of the second gear turn the second switch on or off. Since the second switch is connected to the magnetron, the rotation of the second gear operates the magnetron.

BRIEF DESCRIPTION OF THE DRAWINGS

The object and advantages of the present invention will be more clearly understood to those skilled in the art with reference to the accompanying drawings in which:

FIG. **1** is a side sectional view of an operational switch installed in a conventional microwave oven;

FIG. **2** is a perspective view of a separate state of an operational switch for a microwave oven according to one embodiment of the present invention;

FIG. **3** is a front view of the operational switch showing the state that a power controlling knob as shown in FIG. **2** is located at a step of BROWNER;

FIG. **4** is a front view of the power controlling knob as shown in FIG. **3**;

FIG. **5** is a power circuit diagram of the microwave oven according to FIG. **3**;

FIG. **6** is a front view of the operational switch showing the state that the power controlling knob as shown in FIG. **2** is placed at a step of DEFROST;

FIG. **7** is a front view of the power controlling knob as shown in FIG. **6**;

FIG. **8** is a power circuit diagram of the microwave oven according to FIG. **6**;

FIG. **9** is a front view of the operational switch showing the state that the power controlling knob as shown in FIG. **2** is situated at a step of COMBI;

FIG. **10** is a front view of the power controlling knob as shown in FIG. **9**;

FIG. **11** is a power circuit diagram of the microwave oven according to FIG. **9**;

FIG. **12** is a front view of the operational switch showing the state that the power controlling knob as shown in FIG. **2** is situated at a step of MEDIUM-HIGH;

FIG. **13** is a front view of the power controlling knob as shown in FIG. **12**;

FIG. **14** is a power circuit diagram of the microwave oven according to FIG. **12**;

FIG. **15** is a front view of the operational switch showing the state that the power controlling knob as shown in FIG. **2** is placed at a step of HIGH;

FIG. **16** is a front view of the power controlling knob as shown in FIG. **15**; and

FIG. **17** is a power circuit diagram of the microwave oven according to FIG. **15**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention will now be described in detail referring to the accompanying drawings.

FIG. **2** is a perspective view of the separate state of an operational switch of a microwave oven according to one embodiment of the present invention. A control panel **100** is disposed at one side portion of the front side of a microwave oven. On the front side of control panel **100**, a knob or power controlling knob (not shown) and a timer knob (not shown) are installed and on the rear side thereof gears **110** and **120**, switches **130** and **140** and a timer (not shown) are provided.

At an upper portion of control panel **100**, a projecting portion **101** in the form of a circle is projected toward back direction of the control panel **101**. At the center of projecting portion **101** a knob shaft through hole **106** is formed. A knob shaft **109** of a power controlling knob (not shown) is rotatably inserted into knob shaft through hole **106**. Around the periphery of knob shaft through hole **106**, a boss **102** with a predetermined length is protrudingly formed toward the back direction of control panel **100**. On the circumferential surface of boss **102** a pair of impeding pieces **105**A

and **105**B are protrudingly formed with a predetermined length in an upper and a lower direction respectively. A pair of elastic pieces **103**A and **103**B are protrudingly formed at opposite sites on projecting portion **101** with a predetermined distance from the center of projecting portion **101**. Elastic pieces **103**A and **103**B can be elastically bent in a right and left directions respectively with a fixing end in the center. An engaging jaw **104** is formed on an opposite surface of the elastic piece.

At an edge of projecting portion **101**, a first switch **130** for operating a heater **153** is fixed. First switch **130** has a contact protuberance **132** formed to be pushed in a radial direction of projecting portion **101**.

At a portion separated from projecting portion **101** toward the site of the timer knob with a predetermined distance, a second gear boss **144** for fixing the rotating center of a second gear **120** is protrudingly formed on the rear side of control panel **100**. Second gear boss **144** is formed in the shape of a cylinder and has a second switch **140** fixed at an edge thereof. Second switch **140** is situated at a site separated from second gear boss **144** in a radial direction with a predetermined distance and performs an on/off operation of a magnetron **155**.

At a lower portion of control panel **100**, another boss **164** is formed. Boss **164** receives a timer knob shaft **162** from the front side of control panel **100** and is rotatable.

First gear **110** is inserted into power controlling knob shaft **109**. On the circumference of first gear **110**, teeth are formed and the through hole of first gear **110** is formed suitable to be assembled with power controlling knob **109**. On one of the surfaces of first gear **110** which is to meet with projecting portion **101**, a guiding member **111**, a pushing piece **114** and a stopper **113** are protrudingly formed. Guiding member **111** is made in the shape of a ring and has a plurality of grooves **112** formed along the circumference with the same gap. Groove **112** can receive engaging jaw **104** of elastic piece **103** by elasticity. A pair of pushing pieces **114** on guiding member **111** are formed integrally with guiding member **111** toward projecting portion **101**. A pair of pushing pieces **114** are separated from each other with a predetermined distance on guiding member **111** and each of pushing pieces **114** has slanting parts at both ends thereof for convenient approach to and separation from contact protuberance **132** of first switch **130**. Stopper **113** is protrudingly formed at a site that first gear **110** interferes with a pair of impeding pieces **105**A and **105**B during the rotation of first gear **110**.

Second gear **120** is inserted into second gear boss **144** while meshing together with first gear **110**. On the surface of second gear **120** toward control panel **100**, a pair of pushing pieces **124** and a gap maintaining portion **122** are formed and on the other surface a small size gear **170** meshing together with power controlling gear **172** of the timer is integrally formed.

A pair of pushing pieces **124** are opposingly situated at the site capable of contacting a contact protuberance **142** of second switch **140** with gap maintaining portion **122** of second gear **120** in the center. Each of the pushing pieces has slanting parts at both ends thereof for a convenient approach to and separation from contact protuberance **142**.

FIGS. **4**, **7**, **10**, **13** and **16** illustrate front views of a power controlling knob **160** installed on the front side of control panel **100** respectively. Around power controlling knob **160**, five power controlling steps of BROWNER, DEFROST, COMBI, MEDIUM-HIGH and HIGH are provided. Accordingly, a user can select his/her desired power position by manually rotating power controlling knob **160**.

FIGS. **5**, **8**, **11**, **14** and **17** illustrate power circuit diagrams of a microwave oven according to the present invention.

An electric heater **153** for generating heat and a magnetron **155** for producing high frequency are connected in parallel against an alternating power **151**. Second switch **140** is situated between power **151** and magnetron **155**. A branch terminal between second switch **140** and power **151** is used as a common terminal (COM). One end of a first switch **130** is a common terminal and the other end thereof contacts a normal close terminal (NC) or a normal open terminal (NO) in the alternative. Normal open terminal is connected to a heater **153** and normal close terminal is connected to magnetron **155**. An oven thermistor **157** is connected between power **151** and first switch **130** in order to avoid the overheating of a microwave oven. In addition, a timer is connected in series between power **151** and second switch **140** but that is not shown in the drawings. The timer operates heater **153** or magnetron **155** only for the time period the user set and after the time period set by the user, heater **153** and magnetron **155** are opened due to power **151**.

In the microwave oven according to the present invention described in the foregoing, the operational switch operates as below.

FIG. **3** illustrates a front view of the operational switch when power controlling knob **160** as shown in FIG. **2** is situated at the step of BROWNER. FIG. **4** illustrates a front view of power controlling knob **160** according to FIG. **3**. FIG. **5** illustrates a power circuit diagram of a microwave oven according to FIG. **3**.

If power controlling knob **160** is located at the step of BROWNER as shown in FIG. **4**, a pair of elastic pieces **103**A and **103**B are engaged in groove **112** of guiding member **111** as shown in FIG. **3**. Stopper **113** prohibits first gear **110** from rotating in a clockwise direction by contacting an impeding piece **105**A. Pushing piece **114** puts pressure upon contact protuberance **132** of first switch **130**. At this time, pushing piece **124** of second gear **120** does not press against contact protuberance **142** of second switch **140**.

FIG. **5** illustrates a diagram of the power circuit of a microwave oven when power controlling knob **160** is situated at the step of BROWNER. Since contact protuberance **132** of first switch **130** is pressed, the common terminal is connected to the normal open terminal. Contact protuberance **142** of second switch **140** is not pressed, therefore second switch **140** is opened. Accordingly, only heater **153** is connected to power **151** but magnetron **155** is not connected to power **151**. That is to say, only heater **153** operates for the time period set by the timer. By doing such, the grill function of a microwave oven is accomplished.

FIG. **6** illustrates a front view of the operational switch when power controlling knob **160** as shown in FIG. **2** is situated at the step of DEFROST. FIG. **7** illustrates a front view of power controlling knob **160** according to FIG. **6**. FIG. **8** illustrates a diagram of the power circuit of a microwave oven according to FIG. **6**.

If power controlling knob **160** is located at the step of DEFROST as shown in FIG. **7**, a pair of elastic pieces **103**A and **103**B are engaged in groove **112** of guiding member **111** as shown in FIG. **6**. Stopper **113** enables first gear **110** to rotate in a clockwise or counterclockwise direction by departing from impeding piece **105**A. Since pushing piece **114** has rotated in a counterclockwise direction on the basis of the BROWNER condition, pushing piece does not press contact protuberance **132** of first switch **130**. At this time, second gear **120** rotates in a clockwise direction. The angle of which second gear **120** has rotated in a clockwise direc-

tion is transmitted to power controlling gear **172** of the timer through small-sized gear **170** integrally formed with second gear **120**. Then power controlling gear **172** causes the power of magnetron **155** to become a "weak" condition. At this time, pushing piece **124** of second gear **120** does not press contact protuberance **142** of second switch **140**.

FIG. **8** illustrates a diagram of the power circuit of a microwave oven when power controlling knob **160** is situated at the step of DEFROST. Since contact protuberance **132** of first switch **130** is not pressed, the common terminal is connected to the normal close terminal. Also contact protuberance **142** of second switch **140** is not pressed, therefore second switch **140** is opened. Accordingly, only magnetron **155** is connected with power **151** but heater **153** is not connected to power **151**. That is to say, only magnetron **155** operates according to the power and the time period which have been set by the timer. By doing this, only the original function of a microwave oven is accomplished.

FIG. **9** illustrates a front view of the operational switch when power controlling knob **160** as shown in FIG. **2** is situated at the step of COMBI. FIG. **10** illustrates a front view of power controlling knob **160** according to FIG. **9**. FIG. **11** illustrates a diagram of the power circuit of a microwave oven according to FIG. **9**.

If power controlling knob **160** is located at the step of COMBI as shown in FIG. **10**, a pair of elastic pieces **103**A and **103**B are engaged in groove **112** of guiding member **111** as shown in FIG. **9**. Stopper **113** enables first gear **110** to rotate in a clockwise or counterclockwise direction by further departing from impeding piece **105**A. Since pushing piece **114** has rotated in a counterclockwise direction on the basis of the DEFROST condition, pushing piece presses contact protuberance **132** of first switch **130**. At this time, second gear **120** rotates in a clockwise direction. The angle of which second gear **120** has rotated in a clockwise direction is transmitted to power controlling gear **172** of the timer through small-sized gear **170** integrally formed with second gear **120**. Then power controlling gear **172** causes the power of magnetron **155** to become a "medium" condition. At this time, pushing piece **124** of second gear **120** presses contact protuberance **142** of second switch **140**.

FIG. **11** illustrates a diagram of the power circuit of a microwave oven when power controlling knob **160** is situated at the step of COMBI. Since contact protuberance **132** of first switch **130** is under pressure, the common terminal is connected to the normal open terminal. Also contact protuberance **142** of second switch **140** is pressed, therefore second switch **140** is closed. Accordingly, both magnetron **155** and heater **153** are connected to power **151**. That is, magnetron **155** operates according to the power and the time period which have been set by the timer, and heater **153** operates for the time period set by the timer. By doing such, the combi function of a microwave oven which means the grill function plus the original microwave oven function is achieved.

FIG. **12** illustrates a front view of the operational switch when power controlling knob **160** as shown in FIG. **2** is situated at the step of MEDIUM-HIGH. FIG. **13** illustrates a front view of power controlling knob **160** according to FIG. **12**. FIG. **14** illustrates a diagram of the power circuit of a microwave oven according to FIG. **12**.

If power controlling knob **160** is located at the step of MEDIUM-HIGH as shown in FIG. **13**, a pair of elastic pieces **103**A and **103**B are engaged in groove **112** of guiding member **111** as shown in FIG. **12**. Stopper **113** enables first gear **110** to rotate in a clockwise or counterclockwise direction by further departing from impeding piece **105**A. Since pushing piece **114** has rotated in a counterclockwise direction on the basis of the COMBI condition, pushing piece **114** presses contact protuberance **132** of first switch **130**. At this time, second gear **120** rotates in a clockwise direction. The angle of which second gear **120** has rotated in a clockwise direction is transmitted to power controlling gear **172** of the timer through small-sized gear **170** integrally formed with second gear **120**. Then power controlling gear **172** makes the power of magnetron **155** "medium" condition. At this time, pushing piece **124** of second gear **120** does not press contact protuberance **142** of second switch **140**.

FIG. **14** illustrates a diagram of the power circuit of a microwave oven when power controlling knob **160** is situated at the step of MEDIUM-HIGH. Since contact protuberance **132** of first switch **130** is pressed, the common terminal is connected to the normal close terminal. Also, contact protuberance **142** of second switch **140** is not pressed, therefore second switch **140** is opened. Accordingly, magnetron **155** is connected with power **151** but heater **153** is not connected to power **151**. That is, only magnetron **155** operates according to the power and the time period which have been set by the timer, but heater **153** does not operate. By doing such, only the original microwave oven function is accomplished.

FIG. **15** illustrates a top view of the operational switch when power controlling knob **160** as shown in FIG. **2** is situated at the step of HIGH. FIG. **16** illustrates a front view of power controlling knob **160** according to FIG. **15**. FIG. **17** illustrates a diagram of the power circuit of a microwave oven according to FIG. **15**.

If power controlling knob **160** is located at the step of HIGH as shown in FIG. **16**, a pair of elastic pieces **103**A and **103**B are engaged in groove **112** of guiding member **111** as shown in FIG. **15**. Stopper **113** which is in contact with impeding piece **105**B prohibits first gear **110** from rotating in a counterclockwise direction. Since pushing piece **114** has rotated in a counterclockwise direction on the basis of the MEDIUM-HIGH condition, pushing piece **114** does not press contact protuberance **132** of first switch **130**. At this time, second gear **120** rotates in a clockwise direction. The angle of which second gear **120** has rotated in a clockwise direction is transmitted to power controlling gear **172** of the timer through small-sized gear **170** integrally formed with second gear **120**. Then power controlling gear **172** causes the power of magnetron **155** to become a "strong" condition. At this time, pushing piece **124** of second gear **120** does not press contact protuberance **142** of second switch **140**.

FIG. **17** illustrates a diagram of the power circuit of a microwave oven when power controlling knob **160** is situated at the step of HIGH. Since contact protuberance **132** of first switch **130** is not pressed, the common terminal is connected to the normal close terminal. Also, contact protuberance **142** of second switch **140** is not pressed, therefore second switch **140** is opened. Accordingly, magnetron **155** is connected with power **151** but heater **153** is not connected to power **151**. That is, only magnetron **155** operates according to the power and the time period which have been set by the timer, but heater **153** does not operate. By doing such, only the original function of a microwave oven is performed.

According to the operational switch of a microwave oven of the present invention, a pair of gears and a pair of micro switches are used in order for a magnetron and an electric heater to operate. Therefore, the number of components of the operational switch for a microwave oven is reduced and thereby poor quality components are avoided from being

produced, the assembling time thereof is shortened and the productivity thereof is improved.

It should be obvious to people skilled in the art that various other modifications can be made to the invention as described above without departing from the spirit or the scope of the invention.

What is claimed is:

1. An operational switch for a microwave oven comprising

a knob inserted rotatably into a control panel;

a first gear, the knob having a shaft being inserted into the center of the first gear, and a pair of pushing pieces being protrudingly formed on one face of the first gear;

a first switch for controlling a magnetron by means of the pushing pieces of the first gear;

a second gear meshed with the first gear by teeth, a pair of pushing pieces being protrudingly formed on one face of the second gear, and a small sized gear meshed with a gear of the magnetron for controlling the magnetron power is provided on an opposite face of the second gear; and

a second switch for controlling an electric heater by means of the pushing pieces of the second gear,

whereby the rotation of the knob is transmitted to the first gear, the rotational position of the pushing piece of the first gear turning on/off the first switch, the rotation of the first gear is transmitted to the second gear, and the rotational position of the pushing piece of the second gear turning on/off the second switch and simultaneously rotates the power controlling gear.

2. The operational switch as claimed in claim **1**, wherein the first gear further includes a means for limiting the range of the rotation for the first gear to rotate within a predetermined angle.

3. The operational switch as claimed in claim **2**, wherein the rotation range limiting means include a stopper protrudingly formed on one side of the first gear and a pair of impeding pieces protrudingly formed on the control panel supporting the knob shaft to contact with the stopper.

4. The operational switch as claimed in claim **1**, wherein the first gear further includes a means for guiding the rotation site of the first gear.

5. The operational switch as claimed in claim **2**, wherein the first gear further includes a means for guiding the rotation site of the first gear.

6. The operational switch as claimed in claim **3**, wherein the first gear further includes a means for guiding the rotation site of the first gear.

7. The operational switch as claimed in claim **4**, wherein the rotation guiding means include a pair of elastic pieces protrudingly formed on the control panel opposite to each other and a ring type guiding member provided on one side of the first gear and a plurality of grooves receiving the elastic pieces being formed at the outer periphery of the guiding member.

8. The operational switch as claimed in claim **5**, wherein the rotation guiding means include a pair of elastic pieces protrudingly formed on the control panel opposite to each other and a ring type guiding member provided on one side of the first gear and a plurality of grooves receiving the elastic pieces being formed at the outer periphery of the guiding member.

9. The operational switch as claimed in claim **6**, wherein the rotation guiding means include a pair of elastic pieces protrudingly formed on the control panel opposite to each other and a ring type guiding member provided on one side of the first gear and a plurality of grooves receiving the elastic pieces being formed at the outer periphery of the guiding member.

10. An operational switch for a microwave oven comprising

a knob inserted rotatably into a control panel;

a first gear, at a center of the first gear the knob having a shaft being inserted, on one face of the first gear a pair of pushing pieces being protrudingly formed, at an edge of the pushing pieces a stopper being formed to contact with a pair of impeding pieces projected on the control panel, and a ring type guiding member with a plurality of grooves to receive a pair of elastic pieces protrudingly and oppositely formed on the control panel being provided on the same side thereof;

a first switch for controlling a magnetron by means of the pushing pieces of the first gear;

a second gear meshed with the first gear by teeth, a pair of pushing pieces being protrudingly formed on one face of the second gear, and a small-sized gear meshed with a gear of the magnetron for controlling the magnetron power being provided on an opposite face of the second gear; and

a second switch for controlling an electric heater by means of the pushing pieces of the second gear,

whereby the rotation of the knob is transmitted to the first gear, the rotational position of the pushing piece of the first gear controls and closes the first switch, the rotation of the first gear is transmitted to the second gear, and the rotational position of the pushing piece of the second gear turning on/off the second switch and simultaneously rotates the power controlling gear.

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